YASKAWA

YASKAWA AC Drive 1000-Series Option

CANopen
Installation Manual

Type SI-S3/V, SI-S3/T

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.

安川インバータ1000シリーズオプション

CANopen 通信
取扱説明書

形式 SI-S3/V, SI-S3/T

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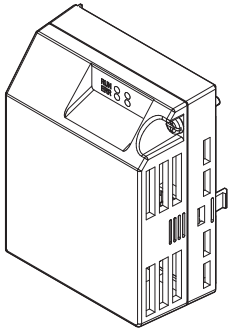

MANUAL NO. TOBP C730600 24D

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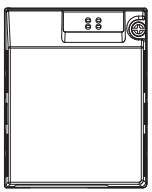
1 Preface and Safety

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

◆ Applicable Documentation

The following manuals are available for CANopen Option unit:

Option Unit

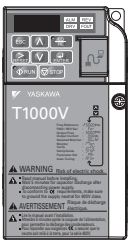
	**YASKAWA AC Drive 1000-Series Option CANopen Installation Manual Manual No. : TOBPC73060024 (this book)**	Read this manual first. The installation manual is packaged with the CANopen Option and contains a basic overview of wiring, settings, functions, and fault diagnoses.
	YASKAWA AC Drive 1000-Series Option CANopen Technical Manual Manual No. : SIEPC73060024	The technical manual contains detailed information. To obtain the technical manual access these sites: Europe: http://www.yaskawa.eu.com Japan: http://www.e-mechatronics.com Other areas: contact a Yaskawa representative.

For the drive setup, refer to one of the documentation listed below.

Yaskawa Drive (V1000)

	Yaskawa AC Drive-V1000 Technical Manual	This manual describes installation, wiring, operation procedures, functions, troubleshooting, maintenance, and inspections to perform before operation. To obtain instruction manuals for Yaskawa products access these sites: Europe: http//www.yaskawa.eu.com Japan: http//www.e-mechatronics.com Other areas: contact a Yaskawa representative
	Yaskawa AC Drive-V1000 Quick Start Guide	This guide is packaged together with the product. It contains basic information required to install and wire the drive. This guide provides basic programming and simple set-up and adjustment.

Yaskawa Drive (T1000V)

	**Yaskawa AC Drive-T1000V Technical Manual**	This manual describes installation, wiring, operation procedures, functions, troubleshooting, maintenance, and inspections to perform before operation. To obtain this manual, contact the local Yaskawa sales office or the nearest Yaskawa representative.
	Yaskawa AC Drive-T1000V Safety Precautions	This guide is packaged together with the product. Covers safety precautions, areas to check upon receiving your new T1000V, and standards compliance.

◆ Terms

Note: Indicates supplementary information that Yaskawa highly recommends be followed, even though equipment may not be at risk.

Drive:	• Yaskawa AC Drive-V1000 Series • Yaskawa AC Drive-T1000V Series
CANopen Option:	Yaskawa AC Drive 1000-Series Option CANopen (SI-S3/V, SI-S3/T)

◆ Registered Trademarks

- CANopen is a registered trademark of the CAN in Automation (CiA).
- Other company names and product names listed in this manual are registered trademarks of those companies.

◆ Supplemental Safety Information

Read and understand this manual before installing, operating, or servicing this option unit. The option unit must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

⚠ DANGER

Indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates an equipment damage message.

■ General Safety

General Precautions

- The diagrams in this section may include option units and drives without covers or safety shields to illustrate details. Be sure to reinstall covers or shields before operating any devices. The option board should be used according to the instructions described in this manual.
- Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
- The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

NOTICE

Do not modify the drive or option circuitry.

Failure to comply could result in damage to the drive or option and will void warranty.

YASKAWA is not responsible for any modification of the product made by the user. This product must not be modified.

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the option unit.

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

■ Option Unit Label Warnings

Warning information is displayed on the option unit as shown in the figure below. Follow all warnings and safety instructions when using the product.
When using the drive in an area that may require displaying warning information in Japanese or Chinese, a sticker is provided with the CANopen Option. This sticker can be placed over the English and French warnings on the front of the CANopen Option.

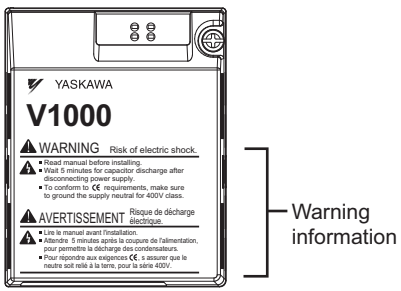

YASKAWA
V1000
WARNING Risk of electric shock.
Read manual before installing.
Wait 5 minutes for capacitor discharge after disconnecting power supply.
To conform to CE requirements, make sure to ground the supply neutral for 400V class.
AVERTISSEMENT Risque de décharge électrique.
Lire le manuel avant l'installation.
Attendre 5 minutes après la coupure de l'alimentation, pour permettre la décharge des condensateurs.
Pour répondre aux exigences CE, s assurer que le neutre soit relié à la terre, pour la série 400V.
Warning information

Figure 1 Warning Labels (example: SI-S3/V)

■ Warning Contents

WARNING Risk of electric shock.

- Read manual before installing.
- Wait 5 minutes for capacitor discharge after disconnecting power supply.
- To conform to CE requirements, make sure to ground the supply neutral for 400V class.

AVERTISSEMENT Risque de décharge électrique.

- Lire le manuel avant l'installation.
- Attendre 5 minutes après la coupure de l'alimentation, pour permettre la décharge des condensateurs.
- Pour répondre aux exigences CE, s assurer que le neutre soit relié à la terre, pour la série 400V.

2 Product Overview

◆ About This Product

The CANopen Option (Model: SI-S3/V, SI-S3/T) is an option unit designed to connect the Yaskawa AC drive to a CANopen network. Using this option unit a CANopen master can

- Operate the drive
- Monitor the drive operation status
- Read or modify drive parameters

The CANopen Option supports the following communication profiles

- DS 301 Ver. 4.02
- DSP 402 Ver. 1.1 Velocity Mode

◆ Applicable Models

The CANopen Option can be used with the drive models in ***Table 1***.

Table 1 Applicable Models

Option Unit	Drive	Software Version <1>
SI-S3/V	CIMR-V□□A□□□□BA□	5010, 1010 and later
	CIMR-V□□A□□□□FA□	5010, 1010 and later
	CIMR-V□□A□□□□JA□	5010, 1010 and later
SI-S3/T	CIMR-T□□V□□□□□□□	6000 and later

<1> See “PRG” on the drive nameplate for the software version number.

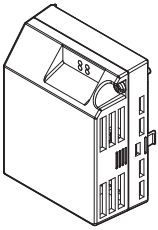
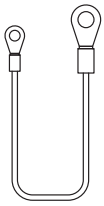
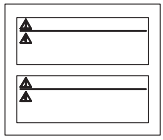
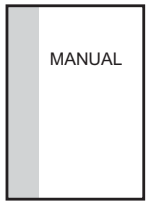
3 Receiving

Please perform the following tasks after receiving the CANopen Option:

- Inspect the CANopen Option for damage.
  If the CANopen Option appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the nameplate (see ***Figure 2***).
- If you have received the wrong model or the CANopen Option does not function properly, contact your supplier.

◆ Contents and Packaging

Table 2 Contents of Package

Description:	Option Unit	Ground Wires	Warning Labels	Installation Manual
–				
Quantity:	1	4	1	1

◆ Tool Requirements

A Phillips screwdriver (M3, M3.5 to M6 <1>) metric or (#1, #2 <1>) U.S. standard size is required to install the CANopen Option.

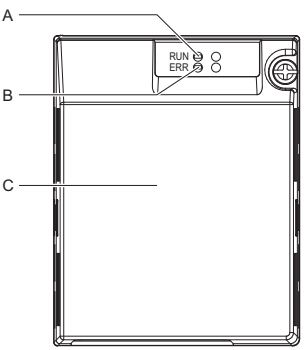
<1> Screw sizes vary by drive capacity. Select a screwdriver that matches the drive capacity.

Note: Tools required to prepare CANopen cables for wiring are not listed in this manual.

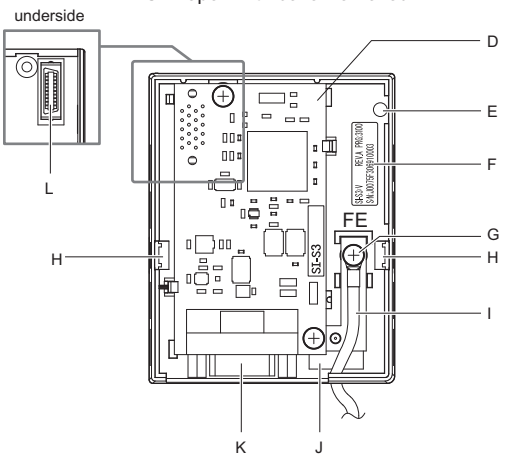
4 CANopen Option Components

◆ CANopen Option

CANopen with cover attached



CANopen with cover removed



A – LED (RUN) *<1>*
B – LED (ERR) *<1>*
C – Option cover
D – CANopen PCB
E – Attachment screw hole for option cover
F – Nameplate
G – Function Earth wire connection (FE)
H – Mounting clip
I – Wire *<2>*
J – Through-hole for wire
K – Communication cable connector (9 pin D-sub)
L – Option board connector

<1> *Refer to CANopen Option Status LEDs on page 15* for details on the LEDs.
<2> Wires are not connected to the CANopen Option and are packaged separately in the box.

Figure 2 Option Unit

◆ Dimensions

The installed CANopen Option adds 27 mm (1.06 in.) to the total depth of the drive.

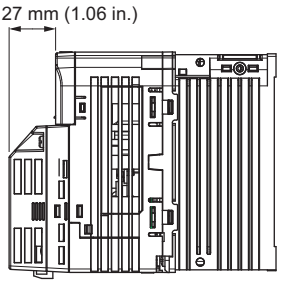


Figure 3 Dimensions

◆ Communication connector

The CANopen Option is connected to the network using a 9 pin D-sub connector. The connector location is illustrated in ***Figure 4***, the pin assignment is explained in ***Table 3***.

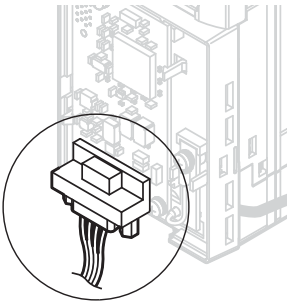
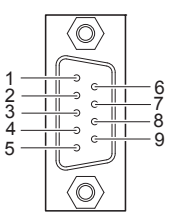


Figure 4 Communication connector location

Table 3 Communication connector (9 pin D-sub)

CANopen Connector	Pin	Signal	Description
Bottom View 	1	–	–
	2	CAN_L	CAN_L bus line (dominant low)
	3	CAN_GND	CAN Ground
	4	–	–
	5	CAN_SHLD	CAN shield
	6	–	–
	7	CAN_H	CAN_H bus line (dominant high)
	8	–	–
	9	–	–
	–	CAN_SHLD	CAN shield

◆ CANopen Option Status LEDs

The CANopen Option has two LEDs that indicate the Option unit or communication status. The indications are conform with the DS303, Part 3: Indicator Specification.

■ Checking LED Operation

Table 4 Understanding the Status LEDs

LED	Color	Display	Meaning
RUN	Green	On	Operational State
		Blinking	Pre-operational State
		Single flash	Stopped
		Flickering <1>	Automatic bit rate detection in progress (alternately flickering with ERR LED)
ERR	Red	On	Bus off
		Blinking	Bus initialization failed (parameter setting error)
		Single flash	Fault has occurred Receiving CAN error frame (too many error frames)
		Double flash	Guard / Heartbeat event has occurred
		Flickering <1>	Automatic bit rate detection in progress (alternately flickering with RUN LED)
		Off	Online

<1> Available in option unit software version 3102 and later.

Figure 5 explains the indicator flash rates.

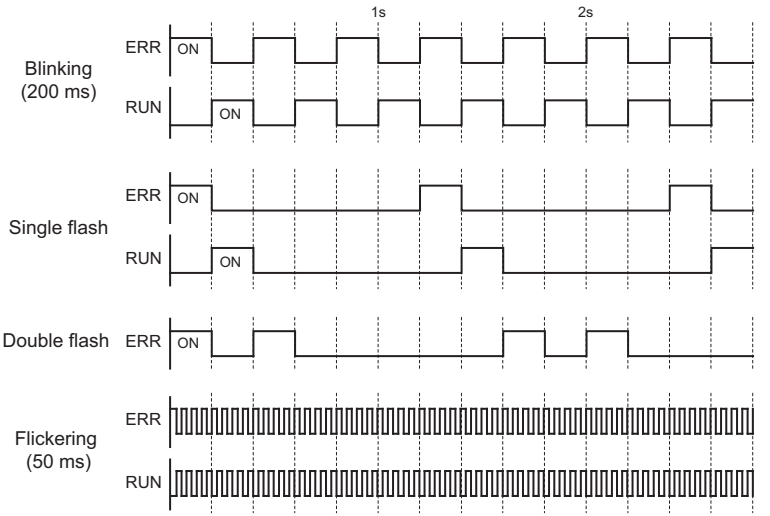


Figure 5 LED Flash Rates and Meaning

5 Installation Procedure

◆ Section Safety

⚠ DANGER

Electrical Shock Hazard

Do not connect or disconnect wiring while the power is on.

Failure to comply will result in death or serious injury.

Disconnect all power to the drive, wait at least five minutes after all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc.

⚠ WARNING

Electrical Shock Hazard

Do not remove option board cover while the power is on.

Failure to comply could result in death or serious injury.

The diagrams in this section may include option units and drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating any devices. The option board should be used according to the instructions described in this manual.

Do not allow unqualified personnel to use equipment.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this product.

Do not use damaged wires, place excessive stress on wiring, or damage the wire insulation.

Failure to comply could result in death or serious injury.

NOTICE

Damage to Equipment

Observe proper electrostatic discharge procedures (ESD) when handling the option unit, drive, and circuit boards.

Failure to comply may result in ESD damage to circuitry.

Never shut the power off while the drive is outputting voltage.

Failure to comply may cause the application to operate incorrectly or damage the drive.

Do not operate damaged equipment.

Failure to comply may cause further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance.

Use shielded twisted-pair wires and ground the shield to the ground terminal of the drive.

Properly connect all pins and connectors.

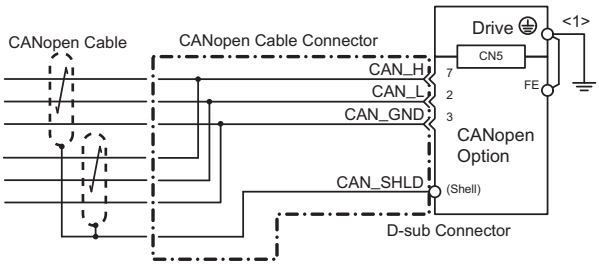
Failure to comply may prevent proper operation and possibly damage equipment.

Check wiring to ensure that all connections are correct after installing the option unit and connecting any other devices.

Failure to comply may result in damage to the option unit.

◆ Wiring the CANopen Option

The CANopen option must be connected to the network using a 9 pin D-sub connector like shown in ***Figure 6***.

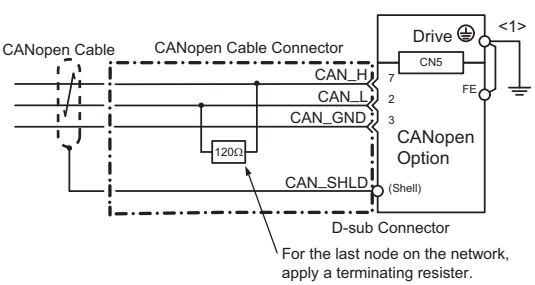


<1> The FE terminal on the CANopen Option must be connected to the drive ground terminal using one of the 4 delivered ground wires.

Figure 6 Wiring Diagram

◆ Termination

Both ends of a CANopen bus system have to be terminated with a 120 Ω resistor. As the CANopen Option has no build in terminating resistor, make sure to apply a terminating resistor as shown in ***Figure 7*** if the CANopen Option is the last node in the network.



<1> The FE terminal on the CANopen Option must be connected to the drive ground terminal using one of the 4 delivered ground wires.

Figure 7 Terminating Diagram

◆ Prior to Installing the Option Unit

Prior to installing the CANopen Option, wire the drive and make necessary connections to the drive terminals. Refer to the Yaskawa drive manual for information on wiring and connecting the drive. Verify that the drive runs normally without the option installed.

◆ Installing the CANopen Option

Remove the front cover of the drive before installing the CANopen Option. Follow the directions below for proper installation.

1. Switch off the power supply to the drive.

DANGER! ***Electrical Shock Hazard*** *- Do not connect or disconnect wiring while the power is on. Failure to comply will result in death or serious injury. Before installing the CANopen Option, disconnect all power to the drive. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are off and measure the DC bus voltage level to confirm safe level.*

2. Remove the front cover.
   The original drive front cover may be discarded because it will be replaced by the CANopen Option cover in step 8.

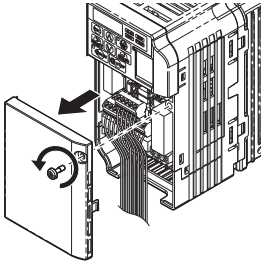


Figure 8 Remove Front Cover

3. Remove the bottom cover and connect the CANopen Option ground wire to the ground terminal.

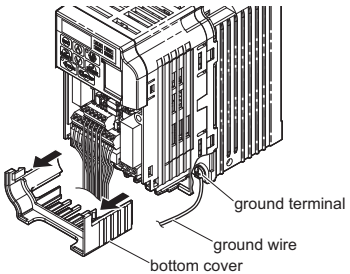
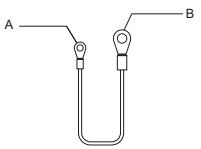


Figure 9 Connect Ground Wire

Note: The four different ground wires packaged with the CANopen Option connect the unit to different models. Select the proper ground wire from the CANopen Option kit depending on drive size.



A – Option unit connection: screw size = M3
B – Drive-side connection: screw size = M3.5 to M6

Figure 10 Ground Wire

Note: Cover removal for certain larger models with a Terminal Cover:
-Single-Phase 200 V Class: CIMR-V☐BA0006 to BA0018, CIMR-T☐BV0006 to BV0018
-Three-Phase 200 V Class: CIMR-V☐2A0008 (for Japan and Asia), CIMR-V☐2A0010 (for the other regions) to 2A0069, CIMR-T☐2V0008 to 2V0069
-Three-Phase 400 V Class: All models
Remove the terminal cover before removing the bottom cover to install the CANopen Option ground wire. Replace the terminal cover after wiring the CANopen Option ground wire.

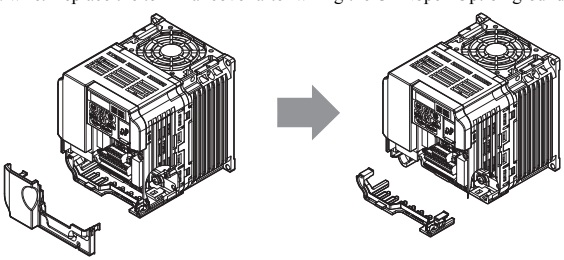


Figure 11 Models with Terminal Cover

4. Reattach the bottom cover.
5. Connect the CANopen Option to the drive. Properly secure the tabs on the left and right sides of the CANopen Option to the drive case.

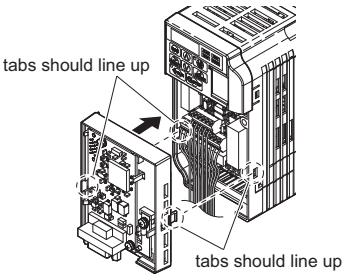


Figure 12 Attach CANopen Option

6. Connect the ground wire from the drive ground terminal to the CANopen Option ground. When wiring the CANopen Option, pass the ground wire through the inside of the drive bottom cover, then pass the ground wire into the through-hole at the front of the CANopen Option.

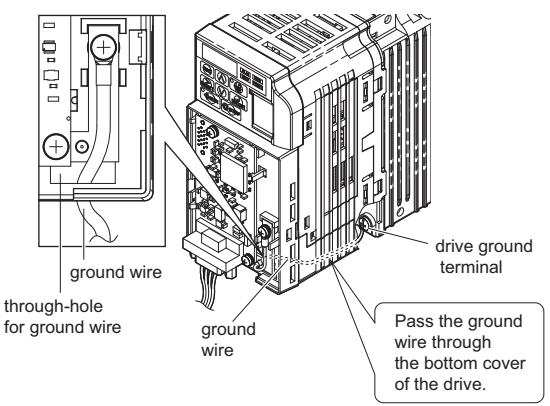


Figure 13 Ground Wire Connection

7. Connect the communications cable to the terminal block.

8. Attach the CANopen Option cover to the front of the CANopen Option.

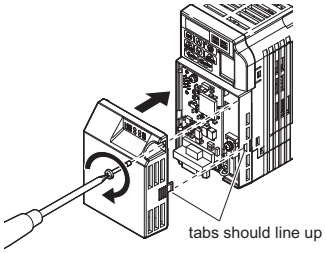


Figure 14 Attach Cover

Note: When using the drive in an area that may require displaying warning information in Japanese or Chinese, a sticker has been provided with the CANopen Option. This sticker can be placed over the English and French warnings on the front of the CANopen Option.

◆ Communication Cable Specifications

To ensure proper performance Yaskawa recommends using CANopen dedicated communication cables only.

◆ EDS Files

For easy network implementation of drives equipped with a CANopen Option, an EDS file can be obtained from:

Europe: http://www.yaskawa.eu.com

Japan: http://www.e-mechatronics.com

Other areas: contact a Yaskawa representative

6 Related Parameters

The following parameters are used to set up the drive for operation with the option. Confirm proper setting of the all parameters in ***Table 5*** before starting network communications.

Table 5 Related Parameters

No.	Name	Description	Values
b1-01 <1>	Frequency Reference Selection	Selects the frequency reference input source 0: Operator - Digital preset speed d1-01 to d1-17 1: Terminals - Analog input terminal A1 or A2 2: MEMOBUS/Modbus communications 3: Option Card 4: Pulse Input (Terminal RP)	Default: <2> Range: 0 to 4
b1-02 <1>	Run Command Selection	Selects the run command input source 0: Digital Operator - RUN and STOP keys 1: Digital input terminals S□ 2: MEMOBUS/Modbus communications 3: Option Card	Default: 1 Range: 0 to 3
E2-04 <3>	Motor 1 Motor Poles	Set the number of motor poles described on the motor nameplate.	Default: 4 Min: 2 Max: 48
F6-01	Operation Selection after Communications Error	Determines drive response when a bUS error is detected during communications with the CANopen Option 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <4>	Default: 1 Range: 0 to 3
F6-02	External Fault Detection Conditions (EF0)	Sets the condition for external fault detection (EF0) 0: Always detected 1: Detected only during operation	Default: 0 Range: 0, 1
F6-03	Stopping Method for External Fault from Communication Option Board	Determines drive response for external fault input (EF0) detection during CANopen communication 0: Ramp to Stop 1: Coast to Stop 2: Fast-Stop 3: Alarm Only <4>	Default: 1 Range: 0 to 3
F6-07 <5>	NetRef/ComRef Selection Function	0: Multi-step speed reference disabled (F7 mode) 1: Multi-step speed reference allowed (V7 mode)	Default: 1 Range: 0, 1

No.	Name	Description	Values
F6-08 <5>	Reset Communication Related Parameters	Determines which communication-related parameters are set back to their original default values when the drive is initialized. 0: Do not reset F6-☐☐ and F7-☐☐ parameters when the drive is initialized using parameter A1-03. 1: Rest F6-☐☐ and F7-☐☐ parameters when the drive is initialized using parameter A1-03. **Note:** Setting this parameter does not affect communication-related parameters.	Default: 0 Range: 0, 1
F6-35 <6> <7>	Node Address	Select the node address of a CANopen Option.	Default: <8> Min: 0 Max: 126
F6-36 <6>	Communication Speed	0: Automatic Bit Rate Detection <9> 1: 10 kbps 2: 20 kbps 3: 50 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1 Mbps	Default: <10> Range: 0 to 8
o1-03 <11>	Digital Operator Display Selection	Sets the units to display the frequency reference and output frequency. 0: 0.01 Hz 1: 0.01% (100% = E1-04) 2: min^{-1} (enter the number of motor poles to E2-04/E4-04/E5-04) 3: User defined by parameters o1-10 and o1-11	Default: <2> Range: 0 to 3

<1> To start and stop the drive from a CANopen master device using serial communications, set b1-02 to 3. To control the frequency reference of the drive via the master device, set b1-01 to "3".
<2> The default value depends on the drive used and the drive software version. For details refer to the technical manual for the drive.
<3> E2-04 is necessary to set up when the Drive Profile DSP402 objects are used.
<4> If set to 3, then the drive will continue to operate when an EF0 fault is detected. Take proper safety measures, such as installing an emergency stop switch.
<5> Drive software versions 1012 and later have F6-07 and F6-08 both set to 1.
<6> Power must be cycled in order to activate the setting after changes.
<7> All node addresses must be unique. If a node address is set to 0, then the ERR light will flash, and AEr will appear on the keypad screen to indicate that an address setting error has occurred.
<8> Default setting is 99 for drive software versions 5010, 1010, and 1011, 0 for software version 1012 or later.
<9> Disabled in option unit software versions up to 3101. Automatic bit rate detection is available in option unit software versions 3102 and later.
<10> For the V1000 drive localized for Europe, the default value is 0 when using the drive software version S1018 and later. For other models, the default value is 6.
For the T1000V drive localized for Europe, the default value is 0 when using the drive software version S6002 and later. For other models, the default value is 6.
<11> Changing o1-03 changes the units for input object 2010 (Hex) (frequency reference), output object 2110 (Hex) (output frequency) and 2200 (Hex) (motor speed).

7 Bit Rate and Node ID Setup

◆ Bit Rate Setup

In order to communicate with the drive, the bit rate set in the CANopen Option must match the bit rate used in the network. The bit rate can be selected manually by using a drive parameter. The CANopen Option can also be set up for automatic bit rate detection.

■ Setting the Bit Rate Manually

Select the correct bit rate in drive parameter F6-36. After changing F6-36, cycle the drive power supply to enable the changes.

Table 6 Bit Rate Setting

No.	Name	Description	Default
F6-36	Communication Speed	0: Automatic Bit Rate Detection <1> 1: 10 kbps 2: 20 kbps 3: 50 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1 Mbps	<2>

<1> Disabled in option unit software versions up to 3101. Automatic bit rate detection is available in option unit software versions 3102 and later.

<2> For the V1000 drive localized for Europe, the default value is 0 when using the drive software version S1018 and later. For other models, the default value is 6.
For the T1000V drive localized for Europe, the default value is 0 when using the drive software version S6002 and later. For other models, the default value is 6.

■ Using Automatic Bit Rate Detection

Note: This function is available in option unit software version 3102 and later.

Set drive parameter F6-36 to 0 to enable automatic bit rate detection and cycle the drive power supply.

When set to automatic bit rate detection, after power up the CANopen Option will listen to messages on the bus and adjust its bit rate setting automatically. When the bit rate is found the CANopen Option will enter pre-operational status and transmit a boot up message containing the drive's node ID. The CANopen Option will not send any messages until the bit rate is detected.

As long as the automatic bit rate detection is in progress, the RUN and ERR LEDs on the CANopen Option will flicker alternatingly.

Note:
1. There must be bus traffic that the CANopen Option can listen to in order to detect the bit rate. If there is low traffic, the bit rate detection might take a long time.
2. The bit rate detected by the CANopen Option is not automatically saved. When cycling the drive power supply, the CANopen Option will perform bit rate detection again.
3. Besides the master, there must be at least one other node in the network that is set to the correct bit rate. For example, the bit rate cannot be detected if the network consists of a master that is set up for a certain bit rate (controller) and one or multiple drives with a CANopen Option set to auto bit rate detection.

◆ Node ID Setup

The node ID can be set in drive parameter F6-35. The value range is 1 to 126. Each node ID may only be used once in the network.

After changing F6-35, cycle the drive power supply to enable the changes.

Note: When the node is set to 0, the ERR light will flash and “AEr” will appear on the drive digital operator to indicate that an address setting error has occurred.

8 Communication Objects Overview

The following tables list up the communication objects supported by the CANopen option unit. For details about the object content refer to the CANopen Option Technical Manual.

◆ Communication Profile Objects (DS 301)

Index (Hex)	Name
1000	Device Type
1001	Error Register
1003	Pre-defined Error Field
1005	COB-ID SYNC Message
1008	Manufacturer Device Name
1009	Manufacturer Hardware Version
100A	Manufacturer Software Version
100C	Guard Time
100D	Life Time Factor
100E	Node Guarding Identifier
1010	Store Parameters
1011	Restore Default Parameters
1014	COB-ID Emergency Object
1016	Consumer Heartbeat Time
1017	Producer Heartbeat Time
1018	Identity Object

◆ Manufacturer Specific Profile Objects (DS 301)

Index (Hex)		Name
Input	2000	Operation Command
	2010	Speed Command
	2020	Torque Limit
	2030	Torque Compensation
	2040	MEMOBUS/Modbus Read Command
	2050	MEMOBUS/Modbus Write Command
	2060	MEMOBUS/Modbus Unlimited Enter Command
	2070	MEMOBUS/Modbus Limited Enter Command
	2080 <I>	Freely selectable (default: none)
	2090 <I>	Freely selectable (default: none)
	20A0 <I>	Freely selectable (default: none)
	20B0 <I>	Freely selectable (default: none)
	20C0 <I>	Freely selectable (default: none)
	3000 <I>	Freely selectable (default: none)
	3100 <I>	Freely selectable (default: none)

Index (Hex)		Name
Output	2100	Drive Status
	2101 <1>	Drive Status (Change of State filter support)
	2110	Output Frequency
	2111 <1>	Output Frequency (Change of State filter support)
	2120	Output Current
	2121 <1>	Output Current (Change of State filter support)
	2130	Output Torque
	2131 <1>	Output Torque (Change of State filter support)
	2140	MEMOBUS/Modbus Read Command Response
	2150	MEMOBUS/Modbus Write Command Response
	2155 <1>	PDO Parameter Write Response
	2160	MEMOBUS/Modbus Not Limited Enter Command Response
	2180 <1>	Freely selectable (default: Input terminal status)
	2190 <1>	Freely selectable (default: Analog input 1 monitor)
	21A0 <1>	Freely selectable (default: none)
	21B0 <1>	Freely selectable (default: none)
	21C0 <1>	Freely selectable (default: none)
	21D0 <1>	Freely selectable (default: none)
	21E0 <1>	Freely selectable (default: none)
	21F0 <1>	Freely selectable (default: none)
	2200	Motor Speed <2>
	2201 <1>	Motor Speed (Change of State filter support) <2>

<1> Available in option unit software version 3102 and later.
<2> Units for motor speed are determined by o1-03. If the control mode for the drive is set to V/f control (A1-02 = 0) and V/f control with simple PG feedback is disabled (H6-01 ≠ 3), then the motor speed will be 0.

◆ Drives and Motion Profile Objects (DSP 402)

The drive supports the Drive and Motion Profile DSP 402 Velocity Mode. Before using the Velocity Mode objects the following parameters have to be set up in the drive:

- The motor pole number must be set up in E2-04.
- The frequency reference and output frequency display unit has to be set to min^{-1} by setting parameter o1-03 = 2.

If these settings are not done properly, the Velocity Mode objects can not be used or deliver wrong data.

Object Type	Index (Hex)	Name
Common Entries	60FD	Digital Inputs *<1>*
	60FE	Digital Outputs *<2>*
Device Control	6040	Controlword
	6041	Statusword
	6061	Modes of operation display
Velocity Mode	6042	vl target velocity
	6043	vl velocity demand
	6044	vl control effort
	6046	vl velocity min max amount
	6048	vl velocity acceleration
	6049	vl velocity deceleration
	604A	vl velocity quick stop
	604C	vl dimension factor
	604D	vl pole number

<1> YASKAWA specifies this object as the drive digital output monitor. (Input from the network)
<2> YASKAWA specifies this object as the drive digital inputs. (Output to the network)

◆ PDO Mapping

The drive supports 15 Receive and 16 Transmit PDOs. The tables below show the available PDOs, their default settings, and the objects that need to be set when changing the PDO configuration or the PDO mapping.

■ Receive PDOs (RxPDO)

PDO number	Receive PDO Parameter		Receive PDO Mapping	
	COB-ID (Hex)	Index (Hex)	Mapped objects	Index (Hex)
1	200 + Node ID	1400	Subindex 1: 6040	1600
2	300 + Node ID	1401	Subindex 1: 6040 Subindex 2: 6060	1601
6	Not assigned	1405	Subindex 1: 6040 Subindex 2: 6042	1605
7	Not assigned	1406	Subindex 1: 6040 Subindex 2: 60FE sub1	1606
8	Not assigned	1407	Subindex 1: 6040 Subindex 2: 6060	1607
21	Not assigned	1414	Subindex 1: 6048 sub1 Subindex 2: 6048 sub2	1614
22	Not assigned	1415	Subindex 1: 6049 sub1 Subindex 2: 6049 sub2	1615
23	Not assigned	1416	Subindex 1: 604A sub1 Subindex 2: 604A sub2	1616
24	Not assigned	1417	Subindex 1: 604C sub1 Subindex 2: 604C sub2	1617
36	Not assigned	1423	Subindex 1: 2000	1623
37	Not assigned	1424	Subindex 1: 2010	1624
38	Not assigned	1425	Subindex 1: 2020	1625
39	Not assigned	1426	Subindex 1: 2030	1626
40	Not assigned	1427	Subindex 1: 2040 sub1	1627
41	Not assigned	1428	Subindex 1: 2050 sub1	1628

■ Transmit PDO (TxPDO)

PDO number	Transmit PDO Parameter		Transmit PDO Mapping	
	COB-ID (Hex)	Index (Hex)	Mapped objects	Index (Hex)
1	180 + Node ID	1800	Subindex 1: 6041	1A00
2	280 + Node ID	1801	Subindex 1: 6041 Subindex 2: 6061	1A01
6	Not assigned	1805	Subindex 1: 6041 Subindex 2: 6044	1A05
7	Not assigned	1806	Subindex 1: 6041 Subindex 2: 60FD	1A06
21	Not assigned	1814	Subindex 1: 6042	1A14
22	Not assigned	1815	Subindex 1: 6043	1A15
23	Not assigned	1816	Subindex 1: 6048 sub1 Subindex 2: 6048 sub2	1A16
24	Not assigned	1817	Subindex 1: 6049 sub1 Subindex 2: 6049 sub2	1A17
25	Not assigned	1818	Subindex 1: 604A sub1 Subindex 2: 604A sub2	1A18
26	Not assigned	1819	Subindex 1: 604C sub1 Subindex 2: 604C sub2	1A19
36	Not assigned	1823	Subindex 1: 2100	1A23
37	Not assigned	1824	Subindex 1: 2110	1A24
38	Not assigned	1825	Subindex 1: 2120	1A25
39	Not assigned	1826	Subindex 1: 2130	1A26
40	Not assigned	1827	Subindex 1: 2140 sub1	1A27
41	Not assigned	1828	Subindex 1: 2150 sub1	1A28

9 Fault Diagnosis and Possible Solutions

◆ Drive-Side Error Codes

Drive-side error codes appear on the drive's LED operator. Causes of the errors and corrective actions are listed in *Table 7*. For additional error codes that may appear on the LED operator screen, refer to the technical manual for the drive.

■ Faults

bUS (CANopen Option Communication Error) and EF0 (External Fault Input from the CANopen Option) may appear as an alarm or a fault. When a fault occurs, the digital operator LEDs will remain lit. When an alarm occurs, the digital operator LEDs will flash and the "ALM" light will illuminate

If communication stops while the drive is running, check the following items:

- Is the CANopen Option properly installed?
- Is the communication line properly connected to the CANopen Option? Is it loose?
- Is the controller program working? Has the controller CPU stopped?
- Did a momentary power loss interrupt communications?

Table 7 Fault Display and Possible Solutions

LED Operator Display		Fault Name
bUS	bUS	CANopen Option Communication Error
		After establishing initial communication, the connection was lost. Only detected when the run command or frequency reference is assigned to the option (b1-01 = 3 or b1-02 = 3).
Cause		**Possible Solution**
Master controller (PLC) has stopped communicating.		Check for faulty wiring. ⇒ Correct any wiring problems.
Communication cable is not connected properly.		
A data error occurred due to noise.		Check the various options available to minimize the effects of noise. ⇒ Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring. ⇒ If a magnetic contactor is identified as a source of noise, install a surge absorber to the contactor coil. ⇒ Make sure the cable used fulfills the CANopen requirements. Ground the shield on the controller side and on the CANopen Option side.
CANopen Option is damaged.		⇒ If there are no problems with the wiring and the error continues to occur, replace the CANopen Option.

LED Operator Display		Fault Name
EF0	EF0	External Fault Input from CANopen Option
		The alarm function for an external device has been triggered.
Cause		**Possible Solution**
An external fault is being sent from the upper controller (PLC).		⇒ Remove the cause of the external fault. ⇒ Reset the external fault input from the upper controller (PLC) device.
Problem with the upper controller (PLC) program.		⇒ Check the program used by the upper controller (PLC) and make the appropriate corrections.

LED Operator Display		Fault Name
oFA00	oFA00	CANopen Option Fault
		CANopen Option is not properly connected.
Cause		**Possible Solution**
Non-compatible option connected to the drive.		⇒ Connect an option that is compatible with the drive.

LED Operator Display		Fault Name
oFA01	oFA01	CANopen Option Fault
		CANopen Option is not properly connected.
Cause		**Possible Solution**
Problem with the connectors between the drive and CANopen Option.		⇒ Turn the power off and check the connectors between the drive and CANopen Option.

LED Operator Display		Fault Name
oFA03	oFA03	CANopen Option Fault
		CANopen Option self-diagnostics error.
Cause		**Possible Solution**
CANopen Option hardware fault.		⇒ Replace the CANopen Option. Contact Yaskawa for assistance.

LED Operator Display		Fault Name
oFA04	oFA04	CANopen Option Fault CANopen Option Flash write mode
Cause		**Possible Solution**
CANopen Option hardware fault.		⇒ Replace the CANopen Option. Contact Yaskawa for assistance.

LED Operator Display		Fault Name
oFA30 to oFA43	oFA30 to oFA43	CANopen Option Fault (port A) Communication ID error
Cause		**Possible Solution**
CANopen Option hardware fault		⇒ Replace the CANopen Option. Contact Yaskawa for assistance.

LED Operator Display		Fault Name
PE 1	PE1	Programming Error 1 Object content mapping was changed from the default, and Node Reset was sent while the drive was running.
Cause		**Possible Solution**
The object dictionary settings were different from the settings stored in the EEPROM of the CANopen Option, and Node Reset (NMT 81h xxh) was performed while the drive was running		⇒ Stop the drive before performing Node Reset ⇒ Save the object dictionary settings using Store Parameters (object 1010 (hex)) before performing Node Reset.

■ Minor Faults and Alarms

LED Operator Display		Minor Fault Name	
AEr	AEr	Setting Address Error CANopen Option is set to an address outside the allowable setting range.	
Cause		**Possible Solution**	**Minor Fault (H2-☐☐ = 10)**
Address outside the specified address range		⇒ Set F6-35 to an address within the specified range.	YES

LED Operator Display		Minor Fault Name	
CALL	CALL	Serial Communication Transmission Error Communication has not yet been established.	
Cause		**Possible Solution**	**Minor Fault (H2-☐☐ = 10)**
Communication wiring is faulty, there is a short circuit, or something is not connected properly.		Check for wiring errors. ⇒ Correct the wiring. ⇒ Remove and ground shorts and reconnect loose wires.	YES
Programming error on the master side		⇒ Check communications at start-up and correct programming errors.	
Communication circuitry is damaged.		Perform a self-diagnostics check. ⇒ Replace the drive if the fault continues to occur.	

10 Specifications

◆ Specifications

Table 8 Option Unit Specifications

Items	Specifications
Model	SI-S3/V, SI-S3/T (PCB model: SI-S3)
Communication Profile	DS 301 Ver. 4.02 DSP 402 Ver. 1.1 Velocity Mode
Connector	9 pin D-sub connector (#4/40 UNC thread)
Communications Speed	10 kbps to 1 Mbps
Ambient Temperature	–10 °C to +50 °C
Humidity	up to 95% RH (no condensation)
Storage Temperature	–20 °C to +60 °C (allowed for short-term transport of the product)
Area of Use	Indoor (free of corrosive gas, airborne particles, etc.)
Altitude	up to 1000 m

◆ Revision History

The revision dates and the numbers of the revised manuals appear on the bottom of the back cover.

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February 2011	◇4	–	Japanese version only.
December 2010	◇3	Front cover, back cover	Revision: Format
		Chapter 6	Revision: Parameter table
		Chapter 7	Addition: Bit Rate and Node ID Setup
		Chapter 8	Revision: Manufacturer Specific Profile Objects (DS 301)
		Chapter 9	Addition: Fault-PE1
August 2010	◇2	Back cover	Revision: Address
June 2008	◇1	Entire document	Edited for procedural clarity and readability. (including table of contents.)
		Chapter 6	Addition: Parameter F6-07, F6-08
		Chapter 7	Revision: Reviewed and corrected Manufacturer Specific Objects (DS 301), Drive and Motion Control (DSP 402), and Drive Error List.
		Chapter 8	Addition: Fault-oFA30 to oFA43 Monitor Faults and Alarms-AEr, CALL
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YASKAWA AC Drive 1000-Series Option

CANopen

Installation Manual

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